
Side Impact Inflatable Restraint Systems

Real World Experience of Side Impact Air Bags in the Special Crash Investigations

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Augustus "Chip" Chidester

National Highway Traffic Safety Administration



Case Selection Criteria

- **High injury outcome with deployment of a side air bag**
- **Allegations of a fatal or seriously injured occupant attributed to the deployment of a side air bag**
- **Deployment of a side air bag into a position occupied by a child.**
- **Deployment of a head occupant protection system into an occupied position.**

Various Types of Side Air Bags

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IC



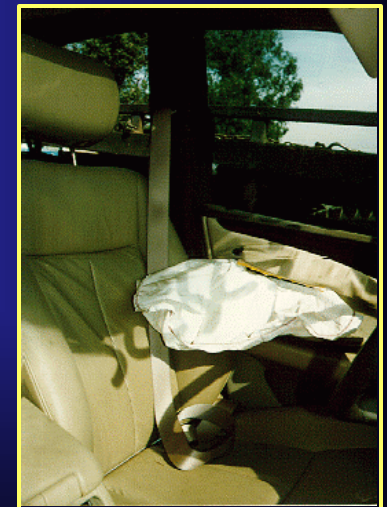
Door/ITS



Seat



Seat H/T



Door

55 Side Air Bag Cases (10/1/01)

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Type of Side Air Bag

Plane of impact

| | Left | Front | Right | Rollover | No Impact | Totals |
|----------|------|-------|-------|----------|-----------|--------|
| Seat | 14 | 3 | 7 | | 2 | 26 |
| Seat/IC | | 1 | | | | 1 |
| Seat H/T | 3 | | | | | 3 |
| Door | 9 | | 5 | 4 | | 18 |
| Door/ITS | 4 | 1 | | 1 | | 6 |
| Door/IC | 1 | | | | | 1 |
| Totals | 31 | 5 | 12 | 5 | 2 | 55 |

55 Side Air Bag Cases (10/1/01)



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11- BMW

9 – Volvo

9 - Mercedes Benz

7 - General Motors

6 – Volkswagen

6- Toyota/Lexus

2 - Nissan/Infinity

1 – Porsche

1 – Mazda

1 – Jaguar

1 – Lincoln

1 - Honda

31 Left Side Impacts

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- 8 - Head and thorax side air bag deployments
 - ❧ 1- **Fatal (severe intrusion) struck in driver's door by school bus**
 - Lacerated Aorta and No Head Injury
 - ❧ 1- **Serious Injury (severe intrusion) struck in driver's door by a pick up truck**
 - Fractured Ribs, Collapsed Lung, Lacerated Spleen, Torn Diaphragm, Torn Bladder and No Head Injury
 - ❧ 3- **Minor**
 - ❧ 3- **To be determined (new cases)**



31 Left Side Impacts

23 - Thorax only side air bag deployments

❧ **5 - Fatal (severe intrusion)**

❧ **1 - AIS – 3 (To be discussed later)**

- 3 fractured ribs with pnemothorax related to the side air bag deployment

❧ **1 - AIS - 2 (Struck by P/U, crushing Injury)**

- Concussion; Fractured left clavicle; Contusions to left side of body, related to left side door panel.

❧ **12 - AIS - 1**

❧ **4 – No injury, a complaint of pain or unknown if injured**

12 Right Side Impacts

- 12 - Thorax only side air bag deployments
 - ✎ 3 - Fatal (severe intrusion)
 - ✎ 3 - AIS - 2 (not side air bag related)
 - Fractured R Wrist, Rib R Contusion, Elbow R Dislocation
 - Fractured Clavicle
 - Fractured Lumbar Vertebrae
 - ✎ 2 - AIS - 1
 - ✎ 1 – No injury, a complaint of pain or unknown if injured
 - ✎ 3 - Not Occupied



13 Fatalities in Side Air Bag Investigations

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NO-SIDE-AIR-BAG- DEPLOYMENT-RELATED- FATALITIES

8 - Driver Fatalities

- ❧ 5 Left side impacts with a thorax deployment
 - severe intrusion
- ❧ 1 Left side impacts with a Head and Thorax deployment
 - severe intrusion
- ❧ 2 Rollover (driver ejection) with a deployment

5 - Passenger Fatalities

- ❧ 3 Right side impacts with a deployment
 - severe intrusion
- ❧ 1 Rollover
- ❧ 1 Frontal

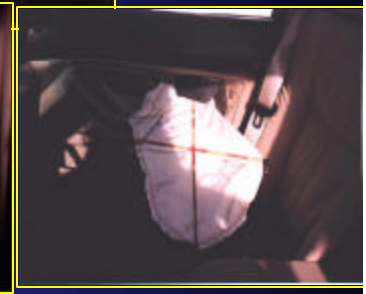


2 Children in Side Air Bag Deployments

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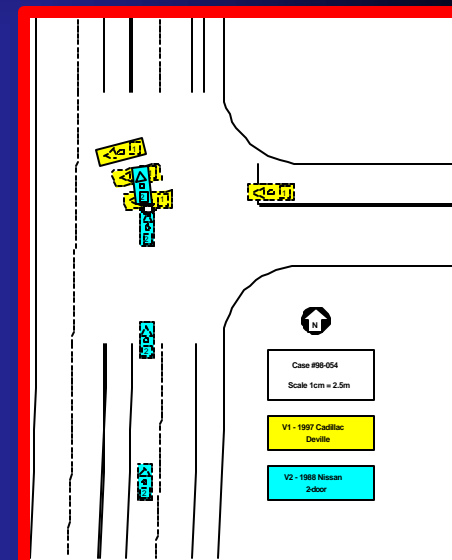
- Right front side air bag deployment, 3 year old male, unbelted, minor injury (AIS-1), injury source was the side airbag cover flap
- Left side, back seat deployment, 13 year old male, unbelted minor injury (AIS-1), injury source side airbag cover flap.



1-Serious Injury Related to a Side Air Bag Deployment

■ Vehicle Damage

- ❧ **09LPEW3**
- ❧ **11.4" (29 cm) of Maximum Crush**
- ❧ **9 MPH (14.5 KMPH) Barrier Equivalent Δ V**



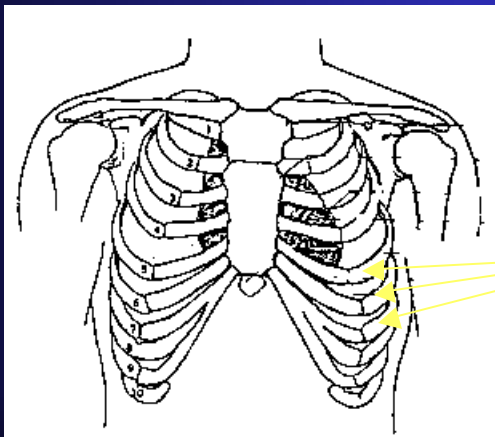
■ Driver Demographics

- ❧ **76 y/o male**
- ❧ **6'2" 180 lbs**
- ❧ **3 point manual restraint in use**

1-Serious Injury Related to a Side Air Bag Deployment

■ Driver Injuries

- ❧ Closed fracture 6, 7 & 8th left lateral ribs (3) with left anterior pneumothorax
- ❧ Abrasion left lateral chest



Exemplar Vehicle & Occupant

1-Serious Injury Related to a Side Air Bag Deployment

Side Air Bag as the Driver Injury Source

- ❧ **Closed fracture 6, 7 & 8th left lateral ribs (3) with left anterior pneumothorax**
 - Resulted from a narrow focused impact
 - Located proximal to the side air bag
- ❧ **Abrasion left lateral chest**
 - Crushing injuries related to intrusion are typically contusions
 - Swiping injuries are abrasions



Seat Mounted Thorax Side Air Bag Issues – 26 Cases

- The fore and aft seat location is not affected.
- Inadvertent deployments.
 - ❧ **Objects against the seat mounted firing trigger.**
- **The air bag has produced minor (AIS-1) injuries**
- The occupant may “miss the air bag” in crashes with a PDOF of one o’clock.
- No head protection



Door Mounted Thorax Side Air Bag Issues – 18 Cases

- The fore and aft seat location is affected.
- Inadvertent deployments.
 - ❧ **GM Recall on Cadillac**
- The cover flap has produced one case with serious (AIS-3) injuries
 - ❧ **Vehicle no longer in production with this air bag configuration**
- The occupant may “miss the air bag” in crashes with a PDOF of one o’clock.
- No head protection



Head Protection Side Air Bag Issues – 11 Cases

- The fore and aft seat location is not affected.
- in the cases with head protection, including at least one fatality due to a thorax injury, the occupant received no life threatening head injuries
- The head protection side air bag has not been attributed to any injuries



Conclusions

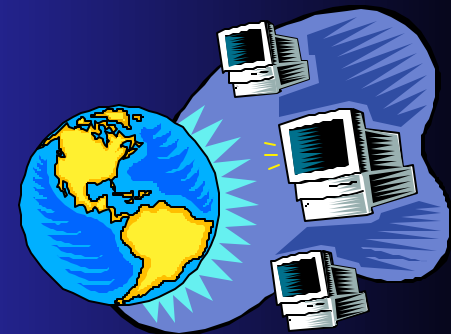
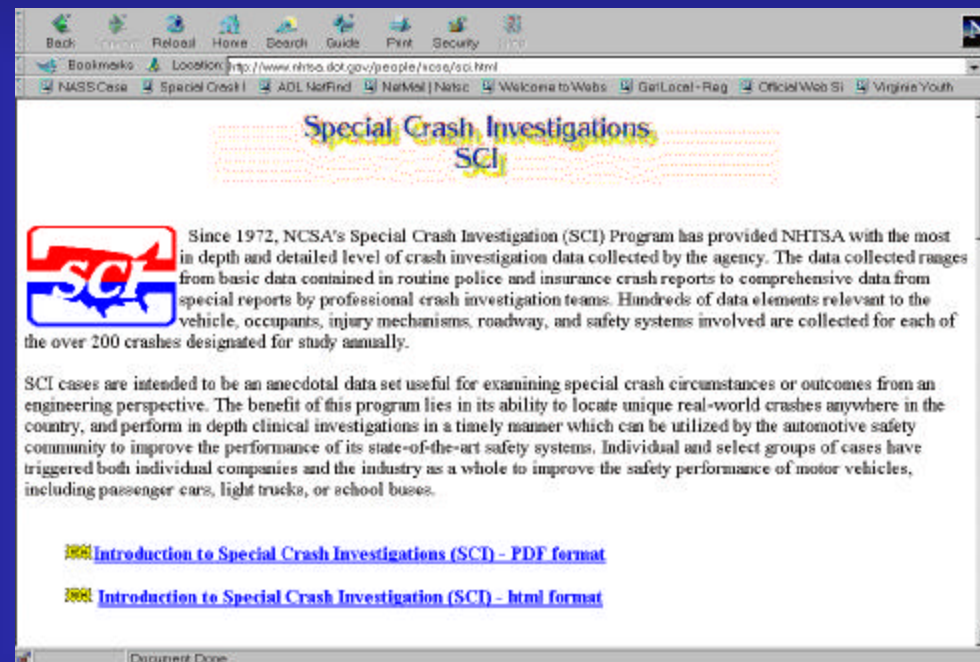
- No fatalities have been attributed to the deployment of a side air bag
- One seriously injured occupant (AIS-3) has been attributed to the deployment of a door mounted side air bag
- In the 2 cases involving children, the side air bags afforded occupant protection.
- The head protection side air bag has been successful in reducing head injury.
- Passenger compartment intrusion is the primary contributor to the fatal injury mechanism.



Public Access to Data

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- Internet accessible through Web site
- <http://www.nhtsa.dot.gov/people/ncsa/sci.html>